

REMARKS/ARGUMENTS

Claims 29-54 are pending. Claims 29-35, 40-42, 47, 48, 50, 51, and 53 have been amended. Claims 32-33, 38, 52, and 54 have been canceled. New claims 55-63 have been added.

Claims 29-31, 34, 35, 38, 39, 41 and 50-52 were rejected under 35 U.S.C. § 102(b) as being anticipated by Bruce *et al.* (US 5,683,825). Claims 29, 30, 33, 36, 38-41, 50 and 52-54 were rejected under 35 U.S.C. § 102(b) as being anticipated by Subramanian (US 6,258,467). Claims 31, 34, 35, 37, 42, 44-49 and 51 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Subramanian (US 6,258,467). Claim 43 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Subramanian (US 6,258,467) in view of Rigney (US 5,350,599).

The new claims presented herein are fully supported by the original specification and do not add new matter.

The amendment at lines 11 and 12 of claim 29 is unrelated to statutory requirements and was not made in an attempt to overcome rejections made by the Examiner. Similarly, the amendments to claims 30, 31, 34, 35, 40, 41, 47, 48, and 53 are also unrelated to statutory requirements.

Examiner Interview

Applicant thanks Examiner Bareford for the telephonic interview conducted on April 20, 2004. Differences between the pending claims and the cited reference were discussed. It was noted that the pyrochlore coating disclosed by Subramanian is distinct from the carbon deposit inhibiting material (CDIM) of the instant invention, and that the pyrochlore coating disclosed by Subramanian would not function as a carbon deposit inhibiting layer of the

instant invention (see discussion hereinbelow of the Subramanian reference). The Examiner indicated that the proposed amendments to claims 29 and 42, namely to recite a coating in which the layer of CDIM is a layer of yttria or a layer of lanthanum oxide, and to claim 50, namely to recite a CDIM layer having a thickness of about 50 mils, would overcome the cited references.

Bruce *et al.* (US 5,683,825)

Bruce *et al.* discloses a thermal barrier coating comprising a metallic bond layer, a ceramic layer on the bond layer, and an erosion resistant composition dispersed within or overlaying the ceramic layer. The erosion resistant composition is either alumina or silicon carbide. The alumina is preferably deposited to a thickness of 20 to 80 micrometers (about 0.8 to 3.2 mils) by an electron beam physical vapor deposition (EBPVD) technique. The erosion resistant composition renders the ceramic layer *resistant to erosion*.

With respect to amended claim 29, Bruce *et al.* does not teach or suggest a method for forming a carbon deposit inhibiting thermal barrier coating (CDITBC), comprising depositing a layer of yttria or a layer of lanthanum oxide on a layer of thermal barrier material.

Applicant submits that Bruce *et al.* does not anticipate, nor render obvious, the specific combination recited in claim 29.

Claims 30, 31, 34, 35, 38, 39 and 41 depend directly or indirectly from claim 29. Applicant submits that claims 30, 31, 34, 35, 38, 39 and 41 patentably distinguish over Bruce *et al.* for at least those reasons given above with respect to claim 29.

With respect to amended claim 50, Bruce *et al.* does not teach or suggest a method for forming a CDITBC, comprising depositing a layer of carbon deposit inhibiting material (CDIM) to a thickness of about 50 mils.

Applicant submits that Bruce *et al.* does not anticipate, nor render obvious, the specific combination recited in claim 50.

Claim 51 depends directly from claim 50. Applicant submits that claim 50 patentably distinguishes over Bruce *et al.* for at least those reasons given above with respect to claim 50.

With respect to new claim 57, Bruce *et al.* does not teach or suggest a method for forming a CDITBC, wherein a layer of yttria or a layer of lanthanum oxide is deposited on a layer of thermal barrier material.

Applicant submits that Bruce *et al.* does not anticipate, nor render obvious, the specific combination recited in claim 57.

Claim 58 depends directly from claim 57. Applicant submits that claim 58 patentably distinguishes over Bruce *et al.* for at least those reasons given above with respect to claim 57. Further, Bruce *et al.* teaches away from claim 58 by disclosing (col. 5 lines 33-35 and col. 6 lines 12-14) that EBPVD is an important aspect of the invention of Bruce *et al.* and that alumina is preferably deposited by EBPVD.

With respect to new claim 59, Bruce *et al.* does not teach or suggest a method for forming a carbon deposit inhibiting thermal barrier coating (CDITBC), wherein a layer of alumina is deposited by plasma spraying.

Applicant submits that Bruce *et al.* does not anticipate, nor render obvious, the specific combination recited in claim 59.

Claims 60-63 depend directly or indirectly from claim 59. Applicant submits that claims 60-63 patentably distinguish over Bruce *et al.* for at least those reasons given above with respect to claim 59.

Subramanian (US 6,258,467)

Subramanian discloses a thermal barrier coating (TBC) consisting essentially of a *pyrochlore* crystal structure consisting of a mixture of elements including Zr, Hf, and Ti. Lanthanum (La) may be *one element* of the pyrochlore.

With respect to amended claim 29, Subramanian does not teach or suggest a method for forming a carbon deposit inhibiting thermal barrier coating (CDITBC), comprising depositing a layer of yttria or a *layer of lanthanum oxide* on a layer of thermal barrier material. Unlike yttria or lanthanum oxide, pyrochlores require two different metallic elements in combination with oxygen.

Applicant submits that Subramanian does not anticipate, nor render obvious, the specific combination recited in claim 29.

Claims 30, 33, 36, and 38-41 depend directly or indirectly from claim 29. Applicant submits that claims 30, 33, 36, and 38-41 patentably distinguish over Subramanian for at least those reasons given above with respect to claim 29.

With respect to amended claim 42, Subramanian does not teach or suggest a method for forming a CDITBC, wherein a layer of yttria or a layer of lanthanum oxide is deposited on a layer of thermal barrier material. As noted,

hereinabove, unlike yttria or lanthanum oxide, pyrochlores require two different metallic elements in combination with oxygen.

Applicant submits that Subramanian does not anticipate, nor render obvious, the specific combination recited in claim 42 as amended.

Claims 43-49 depend directly or indirectly from claim 42. Applicant submits that claims 43-49 patentably distinguish over Subramanian for at least those reasons given above with respect to claim 42.

With respect to amended claim 50, Subramanian does not teach or suggest a method for forming a CDITBC, wherein a layer of carbon deposit inhibiting material is deposited to a thickness of about 50 mils.

Applicant submits that Subramanian does not anticipate, nor render obvious, the specific combination recited in claim 50.

Claim 51 depends directly from claim 50. Applicant submits that claim 51 patentably distinguishes over Subramanian for at least those reasons given above with respect to claim 50.

Further, the thermal barrier material of Subramanian will not function as a carbon deposit inhibiting layer as claimed by applicant: Subramanian teaches a pyrochlore including Zr, Hf, or Ti. Each of these elements can be reduced by, and react with, carbon to form strong carbide bonds (for example, in ZrC). In contrast, applicant claims, in claims 29, 48, and 50, a CDIM layer that is not reduced by carbon. The formation of carbide bonds by the pyrochlore material of Subramanian would facilitate adhesion of carbon deposits on the engine surface, thereby defeating the object of the instant invention. In contrast to the thermal barrier material of Subramanian, the CDIM of applicant does not form

carbide bonds and thus prevents carbon deposit adhesion. Thus, Subramanian teaches away from applicant's invention.

With respect to new claim 57, Subramanian does not teach or suggest a method for forming a CDITBC, wherein the layer of CDIM is a layer of yttria or a layer of lanthanum oxide. As noted, hereinabove, unlike yttria or lanthanum oxide, pyrochlores require two different metallic elements in combination with oxygen.

Applicant submits that Subramanian does not anticipate, nor render obvious, the specific combination recited in claim 57.

Claim 58 depends directly from claim 57. Applicant submits that claim 58 patentably distinguishes over Subramanian for at least those reasons given above with respect to claim 57.

With respect to new claims 59-63, Subramanian does not teach or suggest a method for forming a carbon deposit inhibiting thermal barrier coating (CDITBC), wherein a layer of alumina is deposited by plasma spraying.

Applicant submits that Subramanian does not anticipate, nor render obvious, the specific combination recited in claims 59-63.

Rigney (US 5,350,599)

Rigney discloses a TBC having a porous ceramic lower layer and a denser, less-porous ceramic upper layer. The upper ceramic layer provides increased protection from *erosion*. The lower and upper layers are preferably of the *same material*.

Neither Subramanian nor Rigney teach or suggest depositing a layer of CDIM on a layer of thermal barrier material, wherein the CDIM is a layer of yttria or a layer of lanthanum oxide, as recited in claim 42 as amended. Claim 43 depends directly from claim 42.

Neither Subramanian nor Rigney, taken singularly or in combination, teach or suggest the specific combination as recited in claim 43.

Hasz et al. (US 5,914,189)

Hasz et al. discloses a composite having *at least two outer* protective coatings over a thermal barrier coating (TBC) to decrease *infiltration* of environmental contaminants into openings of the TBC. The at least two outer protective coatings may include non-wetting protective coatings deposited on an impermeable barrier coating or on a sacrificial (or reactive) oxide coating. The contaminants may comprise primarily a mixture of Mg-, Ca-, Al-, and Si oxides. The sacrificial oxide coating usually *reacts chemically with the contaminant* at the surface temperature of the TBC, e.g., 1200°C.

In contrast, applicant claims a method for forming a carbon deposit inhibiting thermal barrier coating (CDITBC) to protect engine surfaces from *carbon deposit adhesion*, wherein the layer of carbon deposit inhibiting material is a refractory material that is *not* reduced by carbon at temperatures *below* 2000° C (e.g., claims 48 and 50, as amended). Thus, Hasz et al. teaches away from applicant's invention.

Further, applicant claims, in new claims 57 and 59 a method for forming a CDITBC consisting essentially of depositing a layer of CDIM on a thermal barrier layer, i.e., the CDITBC has a single outer layer of CDIM on a thermal

barrier layer. In contrast, Hasz *et al.* discloses a composite having *at least two outer protective coatings* over a thermal barrier coating.

Applicant notes that none of the claims were rejected over Hasz *et al.*

Amendment to the Specification

The cross-reference to related application has been updated to indicate that U.S. Application no. 09/932,246, filed August 16, 2001, is now US Patent No. 6,656,600.

Support for amended claims

Support for amendment to claim 29 can be found, for example, at page 4, lines 20-28 (paragraph [013]) of the specification.

Support for amendment to claim 30 can be found, for example, at page 4, lines 11-13 (paragraph [012]) of the specification.

Support for amendment to claim 34 can be found, for example, at page 4, lines 20-28 (paragraph [013]) of the specification.

Support for amendment to claim 40 can be found, for example, at page 4, lines 9-16 (paragraph [012]) of the specification.

Support for amendment to claims 41 and 47 can be found, for example, at page 4, lines 20-27 (paragraph [013]) of the specification.

Support for amendment to claim 50 can be found, for example, in original claims 1 and 10; and page 4, lines 20-28 (paragraph [013]) of the specification.

Support for amendment to claim 51 and 53 can be found, for example, at page 4, lines 20-27 (paragraph [013]) of the specification.

Support for new claims

Support for new claim 55 can be found, for example, at page 2, lines 1-9 (paragraph [003]); page 4, line 21 through page 5, line 2 (paragraph [013]; and page 5, lines 14-18 (paragraph [015]) of the specification.

Support for new claim 56 can be found, for example, at page 5, lines 19-20 (paragraph [016]) of the specification.

Support for new claim 57 can be found, for example, at page 4, lines 20-27 (paragraph [013]) of the specification.

Support for new claims 58 and 59 can be found, for example, at page 5, lines 6-9 (paragraph [014]) of the specification.

Support for new claim 60 can be found, for example, at page 4, lines 9-11 (paragraph [012]) of the specification.

Support for new claim 61 can be found, for example, at page 4, lines 11-13 (paragraph [012]) of the specification.

Support for new claim 62 can be found, for example, at page 4, lines 7-8 (paragraph [011]) of the specification.

Support for new claim 63 can be found, for example, at page 5, lines 21-23 (paragraph [016]) of the specification.

CONCLUSION

Reconsideration and withdrawal of the Office Action with respect to claims 29-54 are requested. Applicant submits that the claims are now in condition for allowance.

In the event that the examiner wishes to discuss any aspect of this amendment, please contact the attorney at the telephone number identified below.

Respectfully submitted,

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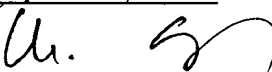
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